



CENTRE NATIONAL D'ÉTUDES SPATIALES

# **43rd ARGOS OPSCOM**

**New London, USA  
June 2009**

## **E42 – Frequency Interference**



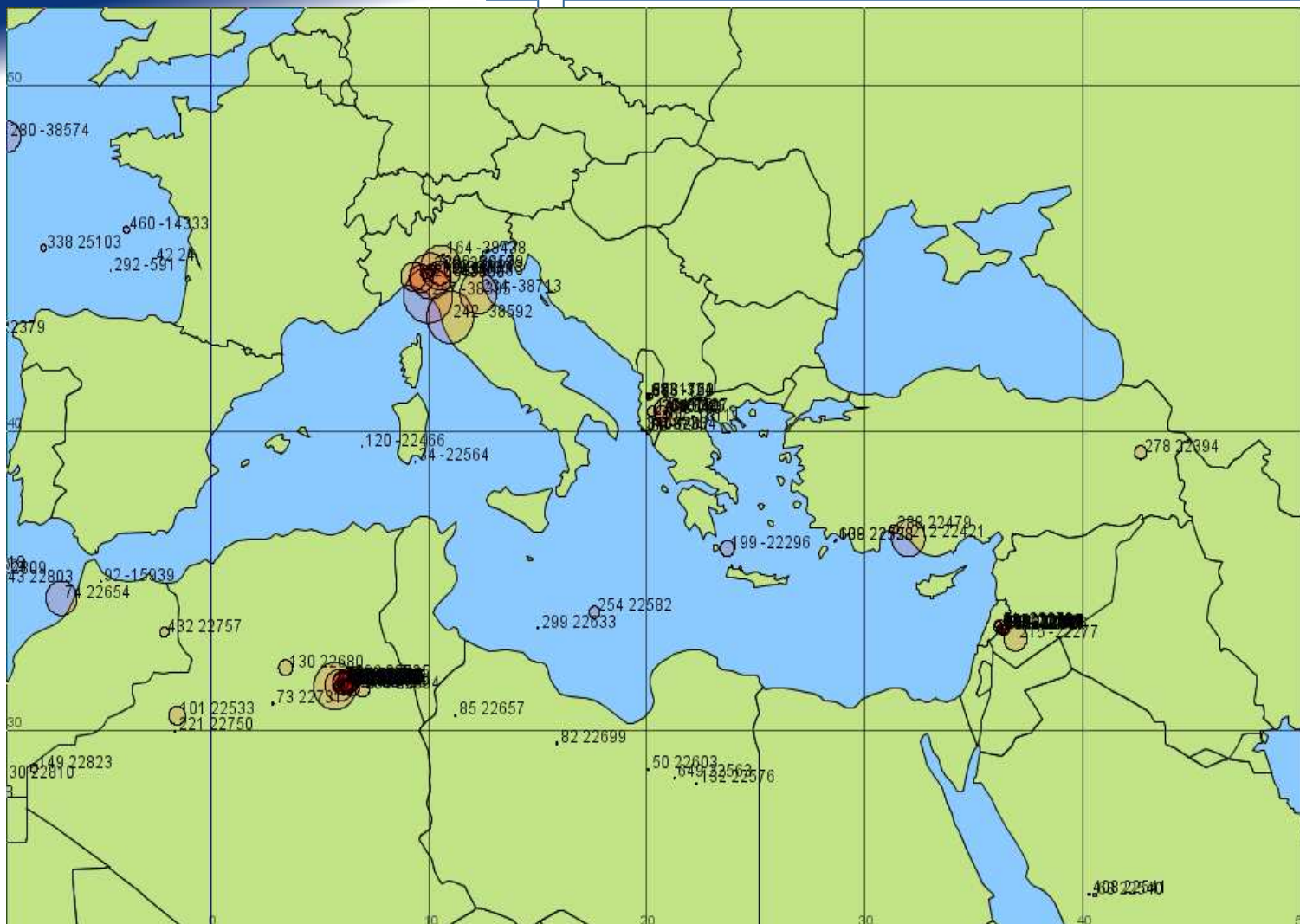
- The increase of total signal is due to an increase of noise. This noise can be issued from several sources (wide-band noise, industrial noise, narrow-band interferers, etc..).
- Through the “pseudo-message” function activated on-board NOAA-16 on January 2006, the SARP-2 instrument is now processing narrow band signals received in the Argos bandwidth, to perform time and frequency measurements and then to provide specific messages which are included in the Argos mission telemetry.
- At ground level, these pseudo-messages are processed and specific algorithms are used to provide location by extracting Doppler curves.

# Interferers in the Argos Band identified in 2006

Ident	Country	Longitude ( °E)	Latitude (°N)	approx. Tx Frequency (/401.65 MHz)	Power Level (dBm)	Location accuracy (km)
ALG001	Algeria	6.0800	31.6327	22700	-116.00	12.80
ITA001	Italy	10.1207	44.7937	-39000	-130.00	56.86
ALB001	Albany	20.2944	40.5871429	0	-105 to -120	60.43
SYR001	Syria	36.2677	33.54556	-22500	-119	7.25
EQU001	Equator (North))	281.3558	-0.2226	-1000	-120.00	5.03
EQU002	uator (South)	281.1315	-0.8542	-3000/-500/2000	-130 to -120	21.00
RUS001	Russia (East)	74.5886	60.6660	25000	-115 to -105	83.04
RUS002	Russia (West)	40.6137	64.5510	-30000/-13000	-125 to -116	82.93

Interferers identified from January to April 2006

# Interferers in the Argos Band identified in 2006



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	Country	longitude(°E)	Latitude (°N)	Loc number	approx. Tx Frequency (/401.65)	Power Level (dBm)	Sigma Long (km)	Sigma Lat (km)
ALG001	Algeria	6.0550	31.6360	36	22660	-117	0.211	0.122
SYR001	Syria	36.2602	33.5302	13	-22500	-119	0.041	0.006
EQU001	Equator (North)	-78.5421	-0.1982	9	-25580	-127	0.030	0.018
RUS001	Russia (East)	74.5371	60.7503	23	24430	-110	0.882	0.334
USA001	USA East	-75.4567	37.9383	8	-4000/+36000	-135	0.077	0.004
USA002	USA East	-76.8413	38.9977	9	-32000/+8000	-131	0.009	0.017
USA003	Alaska	-147.481	64.9716	13	-9000/+37000	-130	0.478	0.075
USA004	Hawaii	-158.0171	21.3151	8	0/40000	-137	0.012	0.014

**The two main interferers are in Algeria and in Russia (same as the ones identified in 2006)**

**The interferers in Syria and Equator were also observed in 2006**

**The US interferers are new and with low levels < -130 dBm (would not be detected if in Europe)**



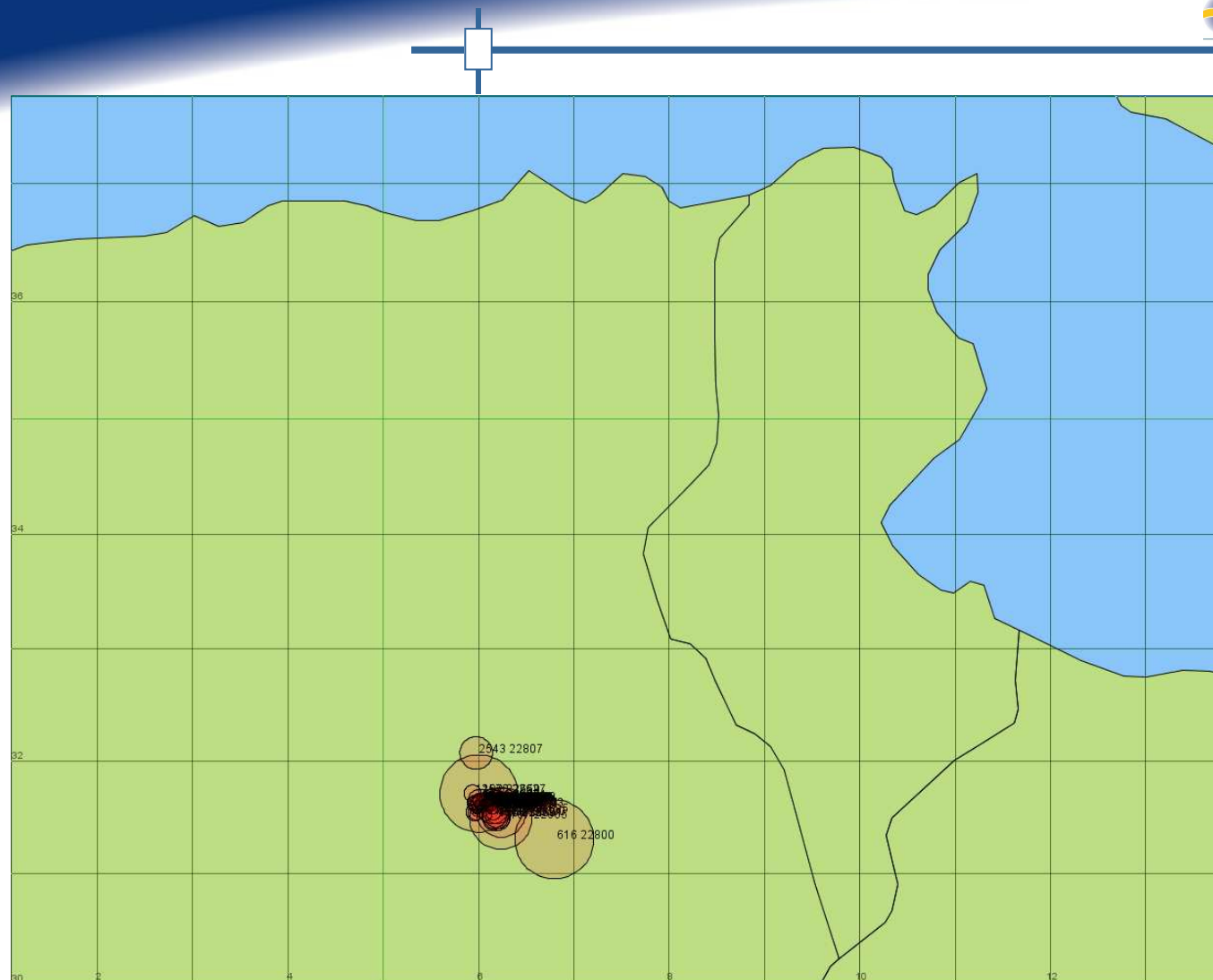
	Country	longitude( °E)	Latitude (°N)	Loc number	approx. Tx Frequency (/401.65)	Power Level (dBm)	Sigma Long (km)	Sigma Lat (km)
ANT001	Antarctique	-34.6423	-77.8702	5	-32000/+8000	-137	0.007	0.008
ALG001	Algeria	6.0710	31.6130	88	22500	-116	0.924	0.568
AUS001	Australie	115.3974	-29.0585	9	-32000/+8000	-137	3.071	0.177
CAN001	Canada	-52.6557	47.5963	13	-32000/+8000	-137	0.081	0.008
CON001	Congo	11.8540	-4.8230	11	-30000	-127	0.707	1.787
EQU001	Equator (North)	-78.5956	-49.3896	31	-25000/+43000	-129	1.067	0.915
KER001	Kerguelen	70.0489	-0.2604	3	-32000/+8000	-129	NA	NA
PAC001	Pacific Ocean	172.9267	1.3530	8	-32000/+8000	-137	0.319	0.017
PER001	Peru	-71.4932	-16.4710	14	-32000/+8000	-136	0.128	0.016
RUS001	Russia (East)	74.4892	60.7779	24	24400	-110	1.231	0.603
RUS002	Russia (West)	40.7250	64.4590	30	-30000/-15000	-119.00	13.315	3.913
USA001	USA	-75.4530	37.9370	11	-4000/+36000	-135	0.012	0.004
USA002	USA	-76.8110	39.0010	28	-32000/+8000	-131	0.007	0.056
USA004	Hawaï	-158.0170	21.3108	12	-40000/0/40000	-136	0.083	0.013



- Two main interferers in Algeria (ALG001) and in Russia (RUS002)  
(same as the ones identified in 2006 and 2007)  
Nota : RUS001 is OFF from March 2008
- Several interferences are using frequencies between 401.618 MHz (-32 kHz in the table) and 401.658 Mhz (+8 kHz in the table) with low levels (-137 dBm)
- It could be the same application for all these interferers
  - ♦ USA 002
  - ♦ ANT 001
  - ♦ AUS 001
  - ♦ CAN 001
  - ♦ KER 001
  - ♦ PAC 001
  - ♦ PER 001

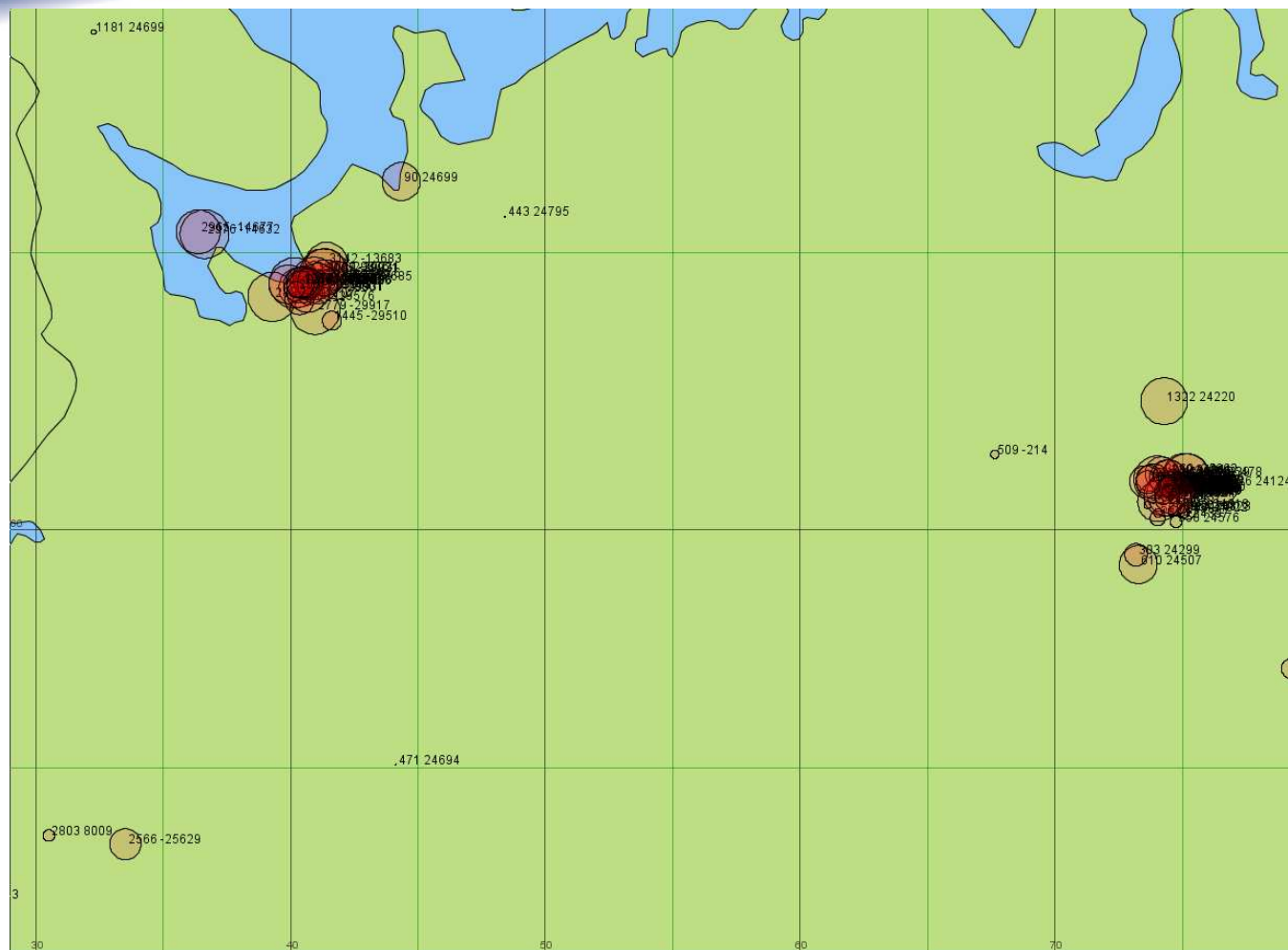


# Location of Algerian Interferer





# Location of Russian Interferers





	Country	longitude( °E)	Latitude (°N)	Loc number	approx. Tx Frequency (/401.65)	Power Level (dBm)	Sigma Long (km)	Sigma Lat (km)
ANT001	Antarctique	-34.6346	-77.8835	46	-32000/+8000	-136	1.234	0.339
ANT003	Antarctique	140.0305	-66.6879	33	-32000/+8000	-136	5.594	0.441
ALG001	Algeria	6.0880	31.6100	52	22500	-116	0.899	0.301
CON001	Congo	11.8996	-4.8056	29	-31000/-13000	-131	4.962	0.276
RUS002	Russia (West)	40.6145	64.4569	41	-30000/-15000	-118	5.793	3.890
USA001	USA	-76.8260	37.9456	16	-4000/+36000	-131	0.049	0.005
USA002	USA	-76.8260	39.0001	23	-32000/+8000	-131	0.421	0.007
USA004	Hawaï	-158.0135	21.3116	19	-40000/0/40000	-137	0.013	0.009
GRO001	Groenland	-68.7903	76.5474	47	-32000/+8000	-136	1.721	0.367

The two main interferers are still in Algeria and in Russia (same as the ones identified in 2006, 2007 and 2008).

The Congo interferer in Pointe-Noire was observed in 2008 : action to ITU to be considered

The US interferers are with low levels < -130 dBm (would not be detected if in Europe)



- Two measurements campaigns : May 08 then August 08
- Three areas :
  - ♦ Pacific Ocean (reference)
  - ♦ Europe
  - ♦ Asia
- Spectral measurements only in coordinated frequency bands :
  - ♦ 399.9 – 400.05 MHz
  - ♦ 401.0 – 401.69 MHz
  - ♦ 402.85 – 403.0 MHz

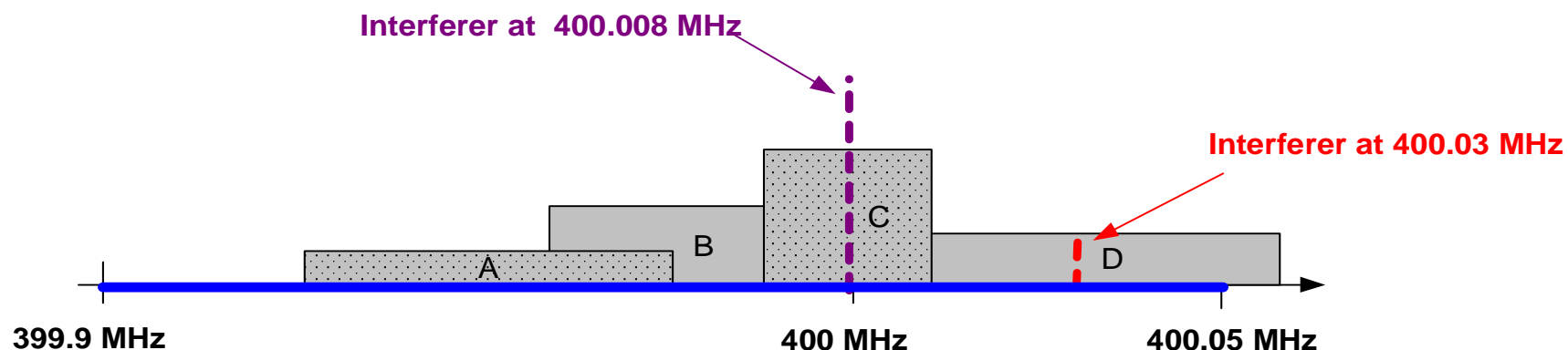


	Above oceans	Asia	Europe
Antenna Temperature	300°K	475 °K	1195 °K
System Temperature (at A-DCS input)	590°K	710°K	1210 °K
Noise Density (at A-DCS input)	-170,9 dBm/Hz	-170,1 dBm/Hz	-167,8 dBm/Hz

## Wideband Noise Density (input A-DCS)

# Noise measurements performed by CNES for Argos-4 (interferers)

Non Environnemental frequency bandwidth



Narrow band Interferers in Asia (< 5 kHz)



Main Interferers in Europe

- Narrow band (< 5 kHz)



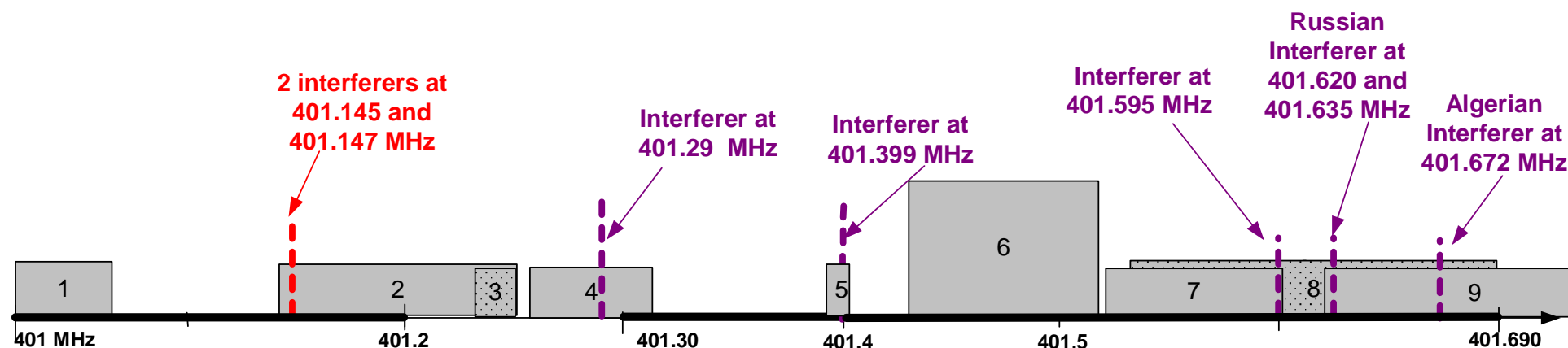
- Broadband

Frequency bandwidth under  
coordination  
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# Noise measurements performed by CNES for Argos-4 (interferers)



## Environnemental frequency bandwidth



Narrow band Interferers in Asia (< 5 kHz)



### Main Interferers in Europe

- Narrow band (< 5 kHz)



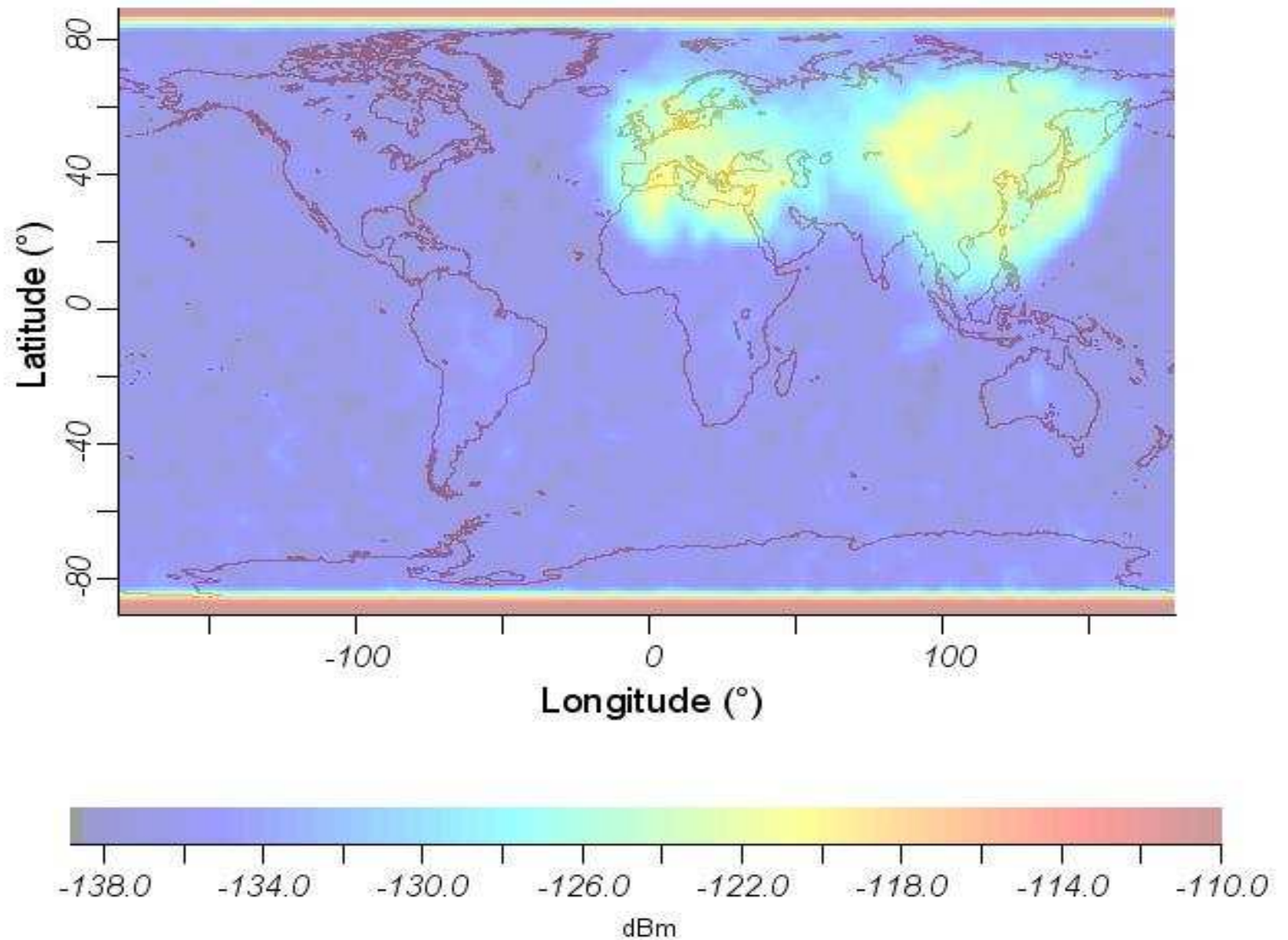
- Broadband



Frequency bandwidth  
coordinated for ARGOS-4

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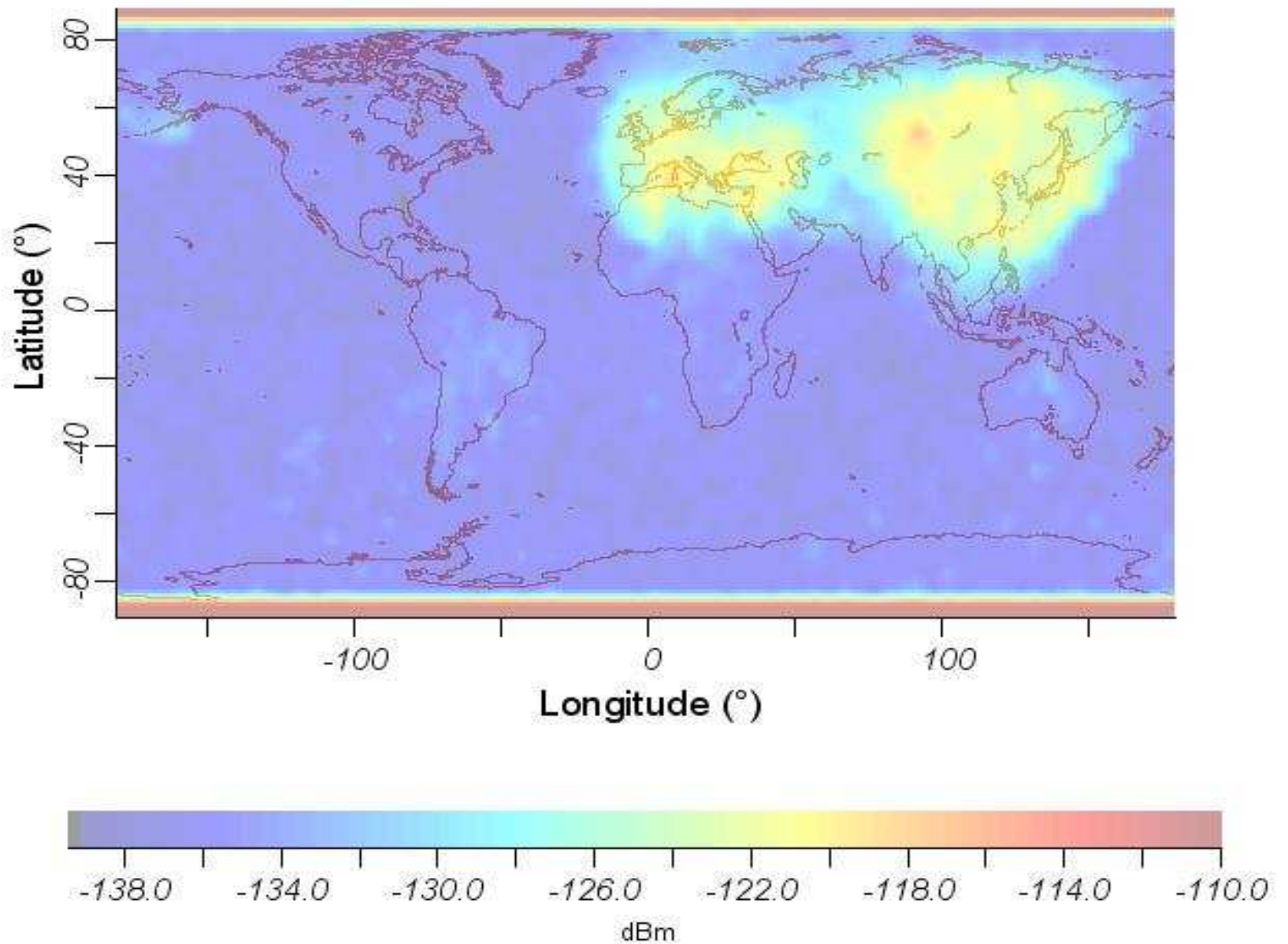
## LDR Minimal received power (dBm)



Sept 07

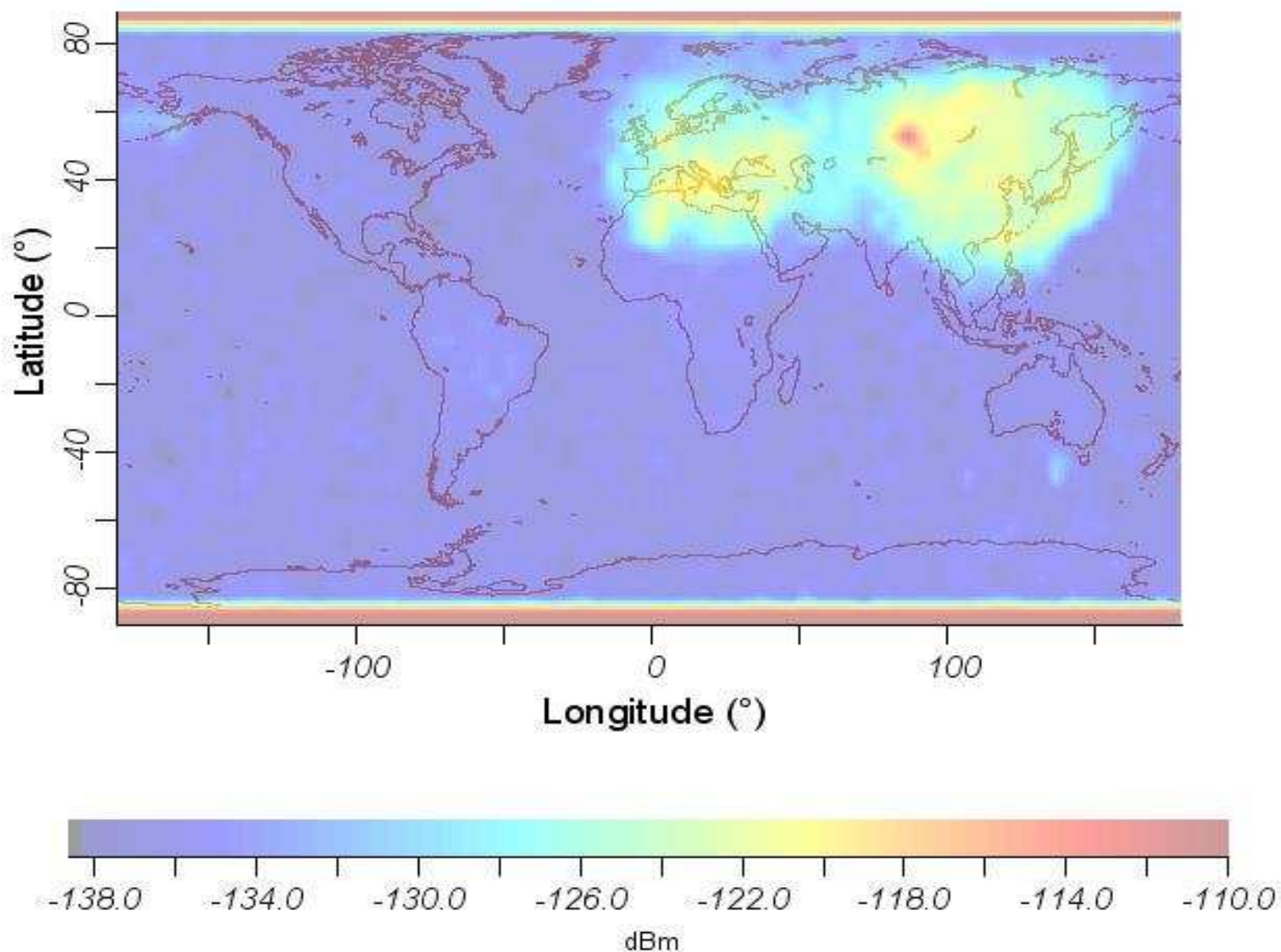


## LDR Minimal received power (dBm)



Nov 07

# LDR Minimal received power (dBm) [6.0 day(s)]



March 08

# LDR Minimal received power (dBm) [5.0 day(s)]

March 09

